Air Quality Impact of a Hot Mix Asphalt Plant
Final Report
Pre-operational and Post-operational Air Sampling Data
August 12, 2010

Project Summary

A Hot Mix Asphalt Air Sampling Project has been conducted in response to community concerns about the air emissions associated with hot mix asphalt plants. Offsite ambient samples were collected in a community near a new hot mix asphalt plant and concentrations of particulate matter, volatile organic compounds, and semi-volatile organic compounds were measured. The project plan called for sampling to be conducted prior to the installation and operation of the hot mix asphalt equipment and again after asphalt production operations had commenced at the completed facility. The pre-operational and post-operational phases of the Hot Mix Asphalt Air Sampling Project have been completed, all valid samples have been analyzed and the data has been verified and validated.

For comparison and to provide context for the concentrations measured, data collected at several National Air Toxic Trend Sites (NATTS) was reviewed. Reference data included the Chesterfield, SC NATTS site, a rural background site in the national network expected to have minimal industrial impact, and NATTS sites in Tampa and St Petersburg, Florida, expected to be representative of urban and suburban concentrations in a coastal area.

After reviewing the project data, it has been concluded that operation of the hot mix asphalt plant did not appear to have a significant impact on typical daily and average ambient air concentrations of particulate matter small enough to be inhaled (PM_{10} or respireable particulate), volatile organic and carbonyl compounds at the monitoring location. Concentrations after operations began were similar to that reported at the reference NATTS sites. While concentrations of Naphthalene and some Alkanes did increase after the facility operation began, the ambient concentrations were well below the concentration standards that have been set to protect health.

Hot Mix Asphalt Plants

Hot mix asphalt paving materials are a blend of aggregate (crushed rock) and liquid asphalt. The materials are dried, heated and mixed at the facility to produce paving asphalt. The facility can be constructed as a permanent plant, a skid-mounted (easily relocated) plant, or a portable plant. The liquid asphalt is composed of a complex mix of organic compounds that are produced during petroleum refining. Particulate matter and a variety of gaseous pollutants, including volatile and semi-volatile organic compounds (VOCs and SVOCs), are released during the heating, mixing, transfer and use of the asphalt. Most hot mix asphalt plants have the capability to use either gaseous fuels (natural gas) or fuel oil to dry and heat the aggregate and keep the liquid asphalt and finished product at the proper temperature, typically 300 to 325 degrees Fahrenheit. The asphalt must be delivered to the point of use and applied at no less than 250 degrees, requiring the plants to be located fairly close to paving sites. The hot mix asphalt plants may be moved as demand changes to minimize delivery time.

Study Objective

This study was conducted in response to concerns about the air emissions associated with hot mix asphalt plants. The objective of the study was to determine the impact of asphalt production on the local ambient air quality. To meet this objective, ambient samples were collected in a community near a new hot mix asphalt plant and concentrations of particulate matter, VOCs and SVOCs were measured.

The range of organic compounds associated with hot mix asphalt production and expected to be in ambient air include carbonyls, C_9-C_{14} alkanes and total Polycyclic Aromatic Hydrocarbons (PAHs). As part of the study, the pre-operational concentrations of those compounds were to be compared to the post-operational concentrations and reported as an indicator of the impacts from the asphalt facility on local ambient concentrations.

For this project, the measured facility related materials are:

Volatile Organic Compounds (VOCs) - compounds containing carbon that are typically a gas at ambient temperatures. They are sampled using the vacuum in a stainless steel canister to capture an air sample for later analysis in a laboratory. The compounds of interest for HMA are Benzene, Methyl Chloroform, Toluene and Xylene.

Semivolatile organic compounds (SVOCs) - compounds that may be a particle or a gas at ambient temperatures. They include:

Polycyclic Aromatic Hydrocarbons (PAHs) - hydrocarbons that consist of fused aromatic rings that do not contain elements other than carbon or have other substituents. The simplest PAH is Naphthalene. Samples were also analyzed for Acenaphthalene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, and Pyrene

Alkanes - straight chain, saturated hydrocarbons Nonane, Decane, Undecane, Dodecane, and Tetradecane.

The sampling method uses both a filter (for particles) and polyurethane foam (for gasses) to capture the material for later analysis in a laboratory.

Carbonyls – a class of organic compounds that include aldehydes and ketones. They are collected by passing the air over a material that reacts with and binds the double bonded oxygen that is characteristic of the class and allows later analysis in a laboratory. The carbonyls of interest are Formaldehyde and Acetaldehyde.

Particulate Matter (PM_{10}) - the small particles or dust less than 10 micrometers in diameter such as those found near roadways and dusty industries that may pass through the throat and nose and enter the lungs. PM_{10} is measured by collecting the particulate on a filter, weighing the material collected and using the amount of air sampled to calculate the concentration.

Project Plan

The approved project plan for the examination of the air quality impact of a hot mix asphalt plant described the sampling to be performed in two phases: pre-operational (prior to construction and operation of the hot mix asphalt plant) and post-operational (after asphalt production had commenced). At least ten valid pre-operational sample sets and at least ten valid post-operational sample sets for carbonyl compounds, VOCs, SVOCs, and particulate matter were planned to be collected and analyzed. During the study, wind data, such as speed and

direction, was also collected during sampling as an indicator of mixing conditions and local weather conditions. Post-operational sampling was expected to resume once the facility was in full operation and weather conditions were similar to that of the initial sampling period.

The initial project plan was amended twice. The planned high volume sampling for respirable particulate as PM_{10} was replaced by a Federal Equivalent Method continuous monitor to provide a more complete record of particulate concentration. Also, an additional intermediate sampling period in late spring 2009 was added. Because of significant delays in the installation and operation of the hot mix asphalt plant at the facility, in March and April 2009 an additional set of carbonyl compound, VOC, and SVOC samples were collected. This was done to examine any differences in the types and concentrations of these compounds that may have resulted from a shift in the wind patterns and cooler ambient temperatures that occur in late Spring.

Sampling Periods

Pre-operational Sampling (June – September 2008)

In the pre-operational period, samples for carbonyl compounds, VOCs and SVOCs were collected once every three days. Sampling started on June 5, 2008, and occurred every third day until July 29, 2008. During this period, only one scheduled sampling event (Sunday, July 20, 2008) was missed, providing eighteen sample sets on that schedule. Beginning on August 4, 2008, samples were collected once every six days until September 27, 2008. At that point, twenty-eight sample sets had been collected. The monitoring plan called for no less than ten sample sets to indicate pre-operational conditions. The installation and operation of the hot mix asphalt plant at the facility was significantly delayed. With no firm schedule for facility startup and the onset of cooler weather, organic sampling was discontinued.

Monitoring for particulate and wind speed and direction was continued throughout the project period from June 5, 2008 through November 8, 2009, including the periods between the organic species sampling periods.

Intermediate Sampling (March – April 2009)

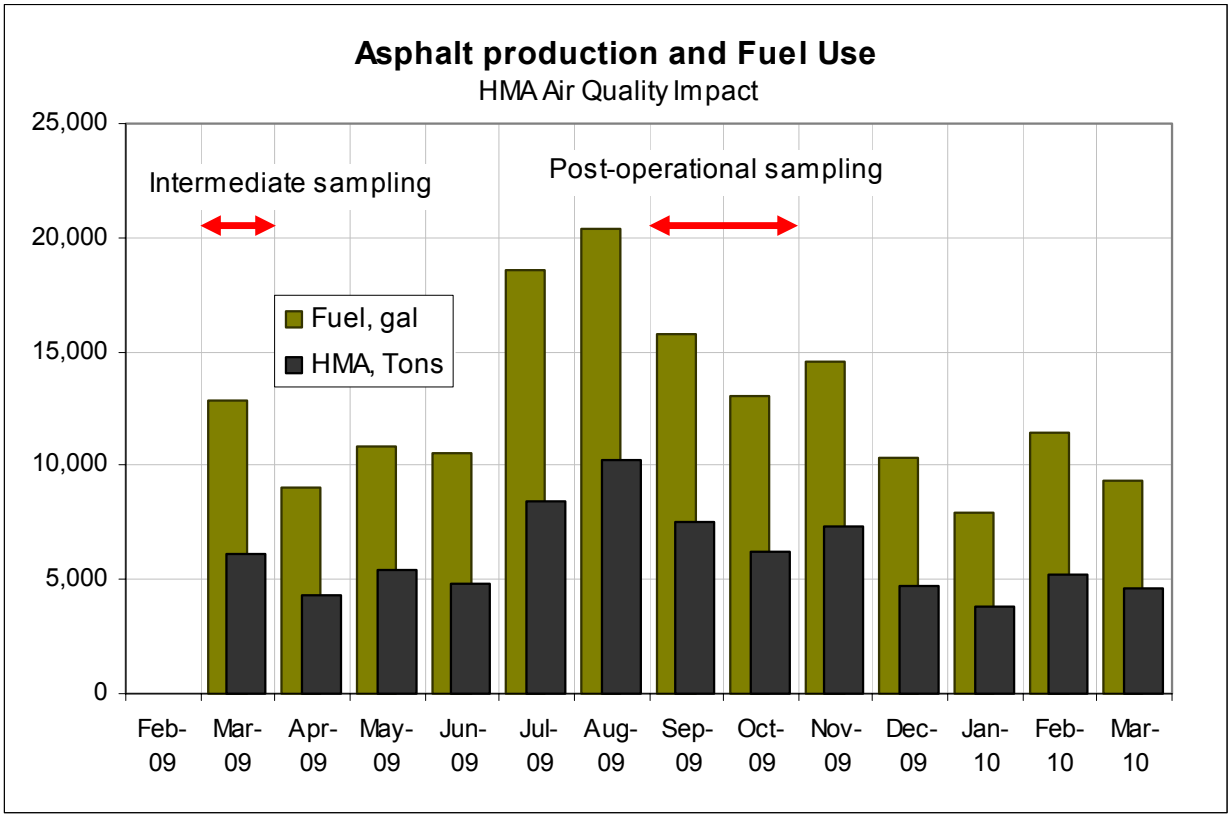
An additional set of samples was collected in March and April 2009 to examine any differences in the types and concentrations of organic compounds that may have resulted from a shift in the wind patterns and cooler ambient temperatures during late spring. During this intermediate sampling period, samples were collected once every three days and analyzed for carbonyl compounds, VOCs, and SVOCs. Sampling started on March 8, 2009, and occurred every third day until April 4, 2009. During this period, no scheduled organic species sampling events were missed, providing ten sample sets.

This sampling period coincidentally occurred immediately after the start of operations at the facility, so data collected during this period are included in the post-operational period analysis.

Post-operational Sampling (September – October 2009)

Resource limitations delayed post-operational sampling of the organics compounds until several months after the facility began operations at the site. Post-operational sampling for carbonyl compounds, VOCs, and SVOCs resumed on September 4, 2009, and continued until October 28, 2009, on a 1 in 6 day schedule. During this period, no scheduled sampling events were missed, providing ten sample sets.

The facility began production of asphalt on March 8, 2009. During the following eight months, through the end of the sampling project, the facility records report the production of 52,952 tons of asphalt. The maximum monthly production was 10,200 tons in August. The reported use of fuel to heat the material was highly correlated to the production rate.



Data completeness

Pre-operational Period (June – September 2008)

Data recovery for the pre-operational sampling significantly exceeded the plan design. In addition to the one missed sample day (July 20) mentioned above, the carbonyl sampler malfunctioned during the June 20, 2008, sampling event, but was replaced before the scheduled sampling event on June 23, 2008. The June 20, 2008, carbonyl sample was the only "VOID" sample for the pre-operational phase of the project.

The formaldehyde concentration in the carbonyl sample collected on August 20, 2008, was atypically high for an ambient sample and more indicative of sampling of air inside a shelter, indicating a leak in the sampling system. The data from that sample is not included in the summaries.

No samples were collected on Sunday, July 20. DHEC staff were not available to set up the weekend sample and the planned number of pre-operation sample sets had been collected by that date. The sampling frequency was reduced to every sixth day starting with the July 29 sample through the conclusion of the preoperational sampling on September 27, 2008.

The continuous PM_{10} monitor malfunctioned on August 5, 2008, and was removed from the site on August 7, 2008. A final audit was not possible and data was voided back to the last

successful audit on July 18, 2008. A replacement PM_{10} monitor was installed on August 20, 2008. The malfunction and subsequent poor data quality resulted in a 72 day data loss for PM_{10} during the 114 days in the pre operational sampling period. Sufficient measurements were available through July 17 to meet pre-operational monitoring objectives for the particulate measurements.

Intermediate Period (March – April 2009)

Data recovery for the post-operational sampling significantly exceeded the plan design. No samples for carbonyl compounds, volatile organic compounds or semi-volatile compounds were missed or invalidated for the March – April sampling period.

The continuous PM_{10} monitor was operating throughout the sampling period. Data was invalidated beginning April 19, after sampling had concluded, due to poor monitor performance. Valid PM_{10} data was available for every day in the 42 day sampling period.

Post-operational Period (September – October 2009)

Data recovery for the post-operational sampling significantly exceeded the plan design. No samples for carbonyl compounds or semi-volatile compounds were missed or invalidated for the September - October sampling period. The sample for volatile organic compounds scheduled for September 16, 2009, was missed due to a sampler malfunction.

The continuous PM_{10} monitor was operating throughout the sampling period. Poor performance of the monitor was detected and the monitor was removed and replaced during the first half of the sampling period. Data was invalid or missing through October 3. Five of the ten scheduled and collected sample sets had associated PM_{10} data available.

Particulate monitoring (June 2008-November 2009)

Prior to the start of sampling, the High Volume sampler that would have provided PM_{10} concentration data only during sample events was replaced by a continuous monitor. The continuous monitor was expected to provide more detailed data throughout the project period. Monitor failures caused data loss in July and August 2008. Although periodic sampler audits indicated adequate performance of the measurements system and daily averages were within the ranges expected for this location, during the final validation of the PM_{10} monitoring data atypically high variability in the hourly concentrations was observed requiring invalidation of approximately 6 months of PM_{10} data. The invalidated data did not include any exceedances of the PM_{10} standards and would not have significantly changed the average concentrations for the project period.

After validation, 275 valid daily PM_{10} averages were available, sufficient for an evaluation of concentrations of respirable particulate in the community during both the pre- and post-operational periods.

A timeline of the complete project period, the sample events and the voided and invalidated measurements is illustrated in the chart at the beginning (page i) of the data tables that contain the monitoring and analytical results.

Observations

Data collected at the rural National Air Toxics Trends site in Chesterfield County, SC and similar available summary data collected at coastal urban and suburban areas in Florida are included in some charts to allow comparison of the results.

The Maximum Allowable Concentration listed in South Carolina Regulation 61-62.5, Standard 8, Toxic Air Pollutants, is used for comparison for any contained in the Standard

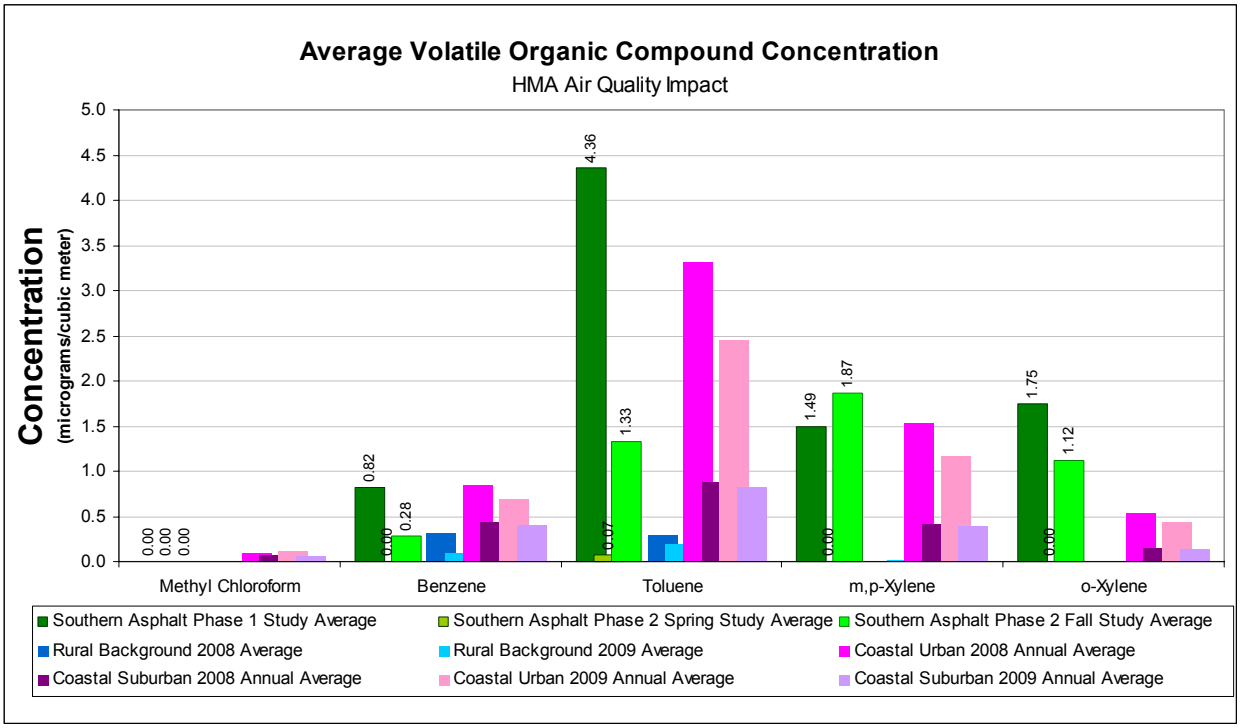
Volatile Organic Compounds:

- Concentrations of all target VOCs were significantly below the SC maximum allowable concentrations during all three sampling periods.

Compound	Maximum Allowable Concentration $\mu g/M^3$
Methyl chloroform	9550
Benzene	150
Toluene	2000
m, p xylene	4350
o- xylene	4350

- Concentrations of all volatile organic species detected (benzene, toluene, and xylenes) were higher than the same species at the rural site in Chesterfield County, SC, but within concentration ranges reported for urban NATTS locations. Most volatile species detected at the Chesterfield site are at or below our instrument detection limits.
- Toluene concentrations were the highest of the VOC species detected. The highest toluene concentration was detected in the first sample on June 5, 2008.
- Concentrations of benzene, toluene and xylene were highest at the beginning of the pre-operational sampling period. Concentrations of all three species dropped after the first few samples and concentrations were consistent throughout the remainder of the study period
- Toluene was detected in 26 of the 28 samples collected in the pre-operational sampling. Toluene was detected in only 1 of the 10 samples collected during the March/April 2009 sampling period and in 6 of the 10 samples collected during the September/October 2009 post-operational period.
- Benzene was detected in 21 of the 28 samples and xylene was detected in 25 of the 28 samples in the pre-operational sampling. Benzene was not detected in any of the ten samples collected in the March/April 2009 sampling period and in 6 of the 10 samples collected during the September/November 2009 post-operational period.
- 1,1,1-Trichloroethane (Methyl chloroform) was not detected in any of the 28 project samples collected during the pre-operational sampling nor any of the 20 total samples collected during the post-operational period.
- Average concentrations for all volatile organic species were less during both post-operational study periods than in the initial pre-operational sampling.
- The highest individual sample concentrations for all the volatile organic species quantified in the study were seen during the pre-operational period. . No local

activities were noted that would account for the higher concentrations during the initial sampling.



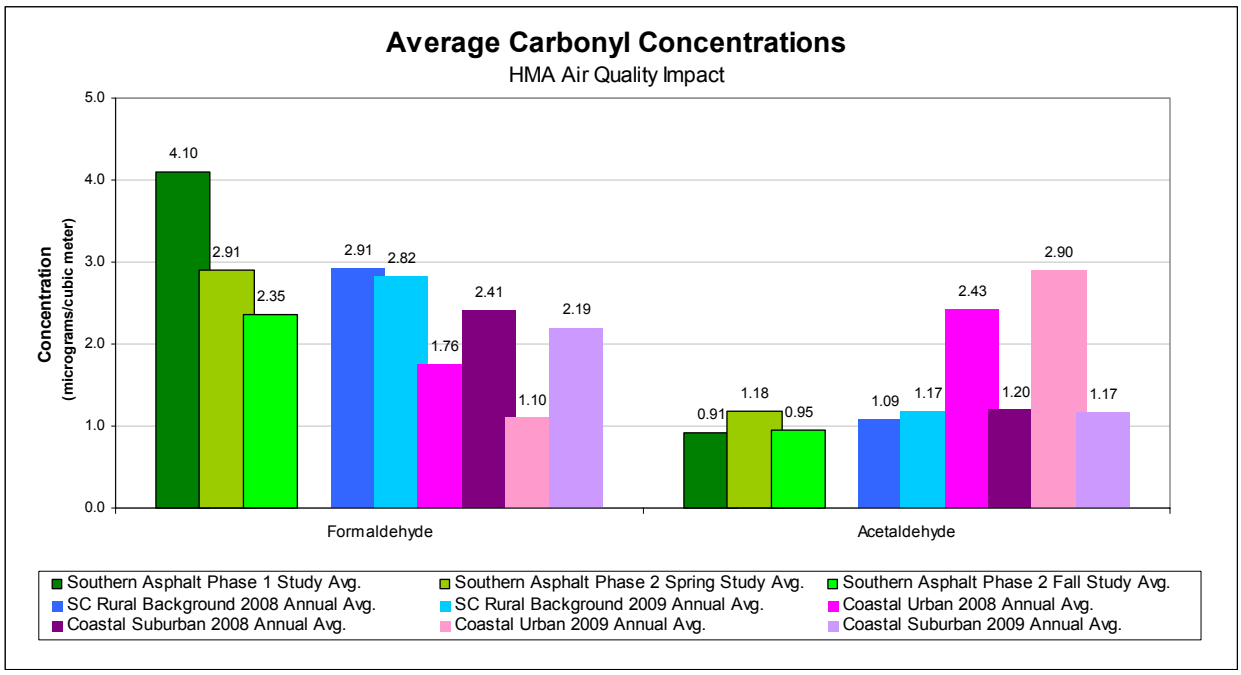
Carbonyl Compounds:

- Concentrations of all carbonyl compounds were significantly below the South Carolina maximum allowable concentrations.

Compound	Maximum Allowable Concentration $\mu g/M^3$
Formaldehyde	15
Acetyldehyde	1800

- The average formaldehyde concentration (4.1 $\mu g/M^3$) for the pre-operational sampling was comparable to the SC rural background (4.7 $\mu g/M^3$) average concentration for the same time period.
- The average formaldehyde concentration for the March/April post-operational sampling (2.9 $\mu g/M^3$) and the September/October post-operational sampling (2.4 $\mu g/M^3$) were comparable to the annual rural background average concentration (2.8 $\mu g/M^3$) for 2009.
- In general, higher concentrations of formaldehyde were detected at the beginning of the study. Concentrations of formaldehyde dropped after the first few samples and tended to be more consistent further into the pre-operational and post-operational sampling periods, similar to the trend of the volatile organic compounds.

- Formaldehyde concentrations were typically higher during the pre-operational sampling than during either post-operational sampling period.
- Formaldehyde and acetaldehyde were detected in all of the valid samples collected throughout the three study periods.



Semi-volatile Organic Compounds

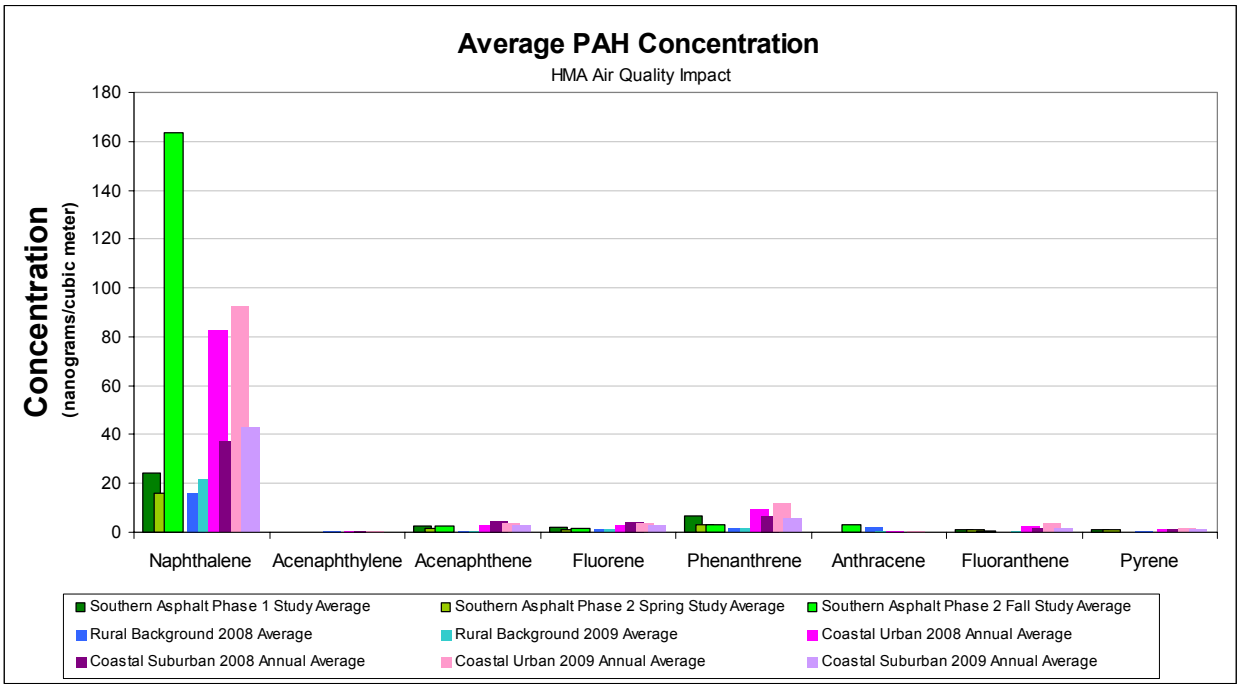
- Concentrations of all semi-volatile organic compounds were significantly below the South Carolina maximum allowable concentrations.

Compound	Maximum Allowable Concentration $\mu g/M^3$
Naphthalene	1250
Polycyclic Organic Matter	160

Polycyclic Aromatic Hydrocarbons (PAHs)

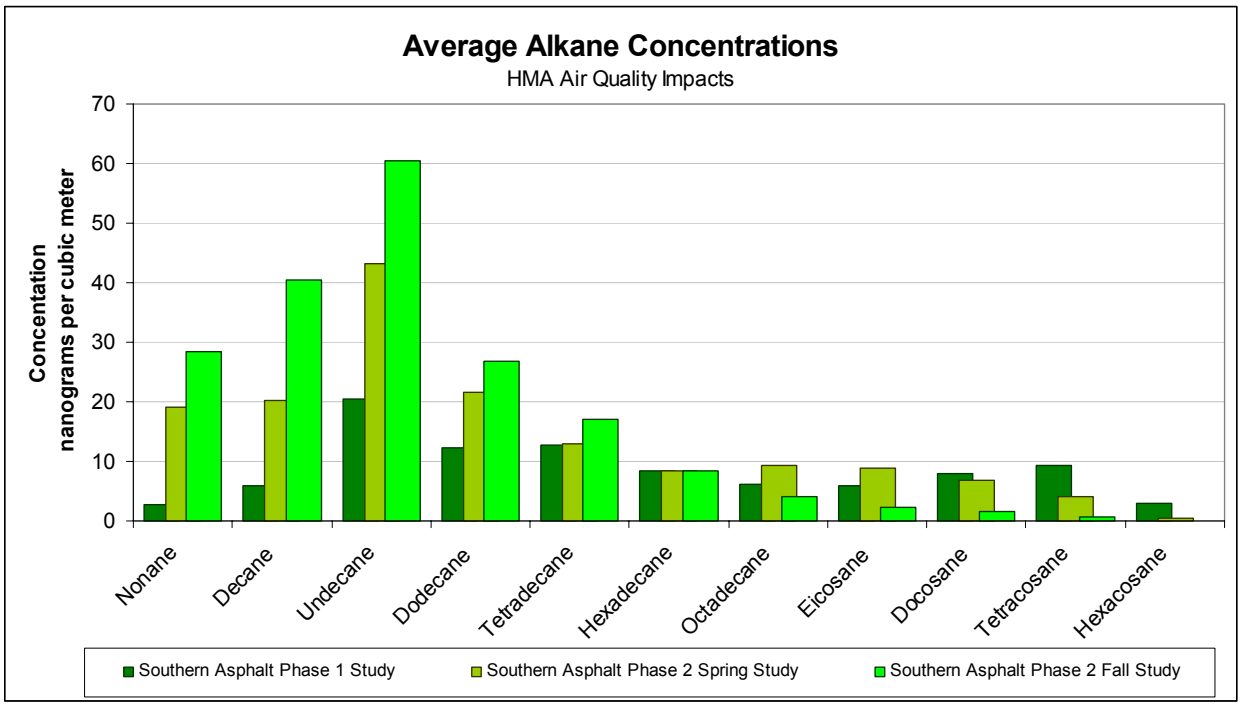
- The types of PAHs detected at the study site are consistent with types detected at other sites throughout the state, including the Chesterfield rural background site.
- Naphthalene, acenaphthene, fluorine, phenanthrene, fluoranthene and pyrene were the only PAHs detected at the site during any of the sampling studies.
- Naphthalene, fluorene, and phenanthrene were the only PAHs detected in all of the semi-volatile samples collected during the three study periods.
- The concentrations of all of the PAHs detected at the site are higher than that seen at the Chesterfield rural background site but lower than reference urban or suburban sites (except for naphthalene).

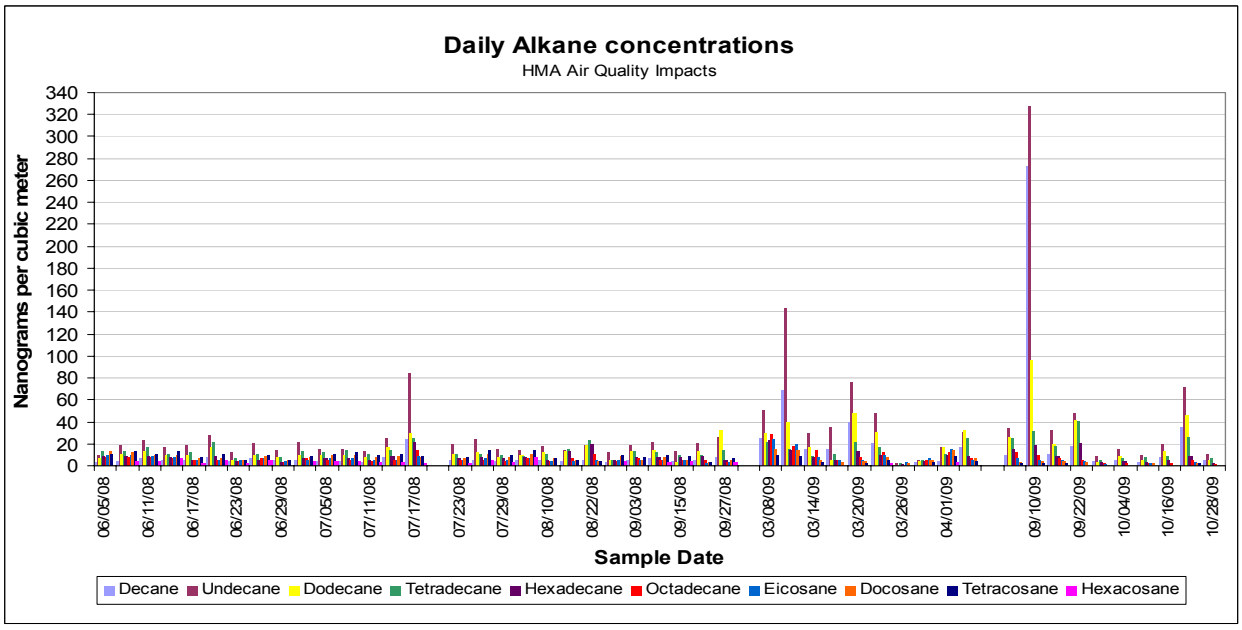
- Naphthalene was the major PAH detected. Naphthalene concentrations detected at the site were above Chesterfield rural background concentrations.
- The highest concentrations of naphthalene were detected toward the end of the pre-operational study period (August and September) and at the end of the September/October post-operational sampling. The highest observed concentration of naphthalene (331 nanograms/M^3) was detected in the last sample collected on October 28, 2009. The increase in concentrations may be in part due to relatively cooler ambient temperatures increasing the collection efficiencies of semi-volatile compounds in the sampling media.
- Naphthalene concentrations were the highest in samples collected in the September thru October 2009 post-operational study period but were still significantly below the maximum allowable concentrations.



Alkanes

- The alkanes detected at the study site were typical of that detected at most sites in other areas of South Carolina.
- Undecane(C_{11}) was the predominant species detected but decane(C_{10}), dodecane(C_{12}), and tetradecane(C_{14}) were also detected in most of the samples.
- The specific alkane species detected in the pre-operational sampling were detected in all three sample periods. No new or additional compounds were detected after the start of hot mix asphalt operations.
- The highest concentration of any one alkane species was 328 nanograms/M^3 of undecane on September 10, 2009.

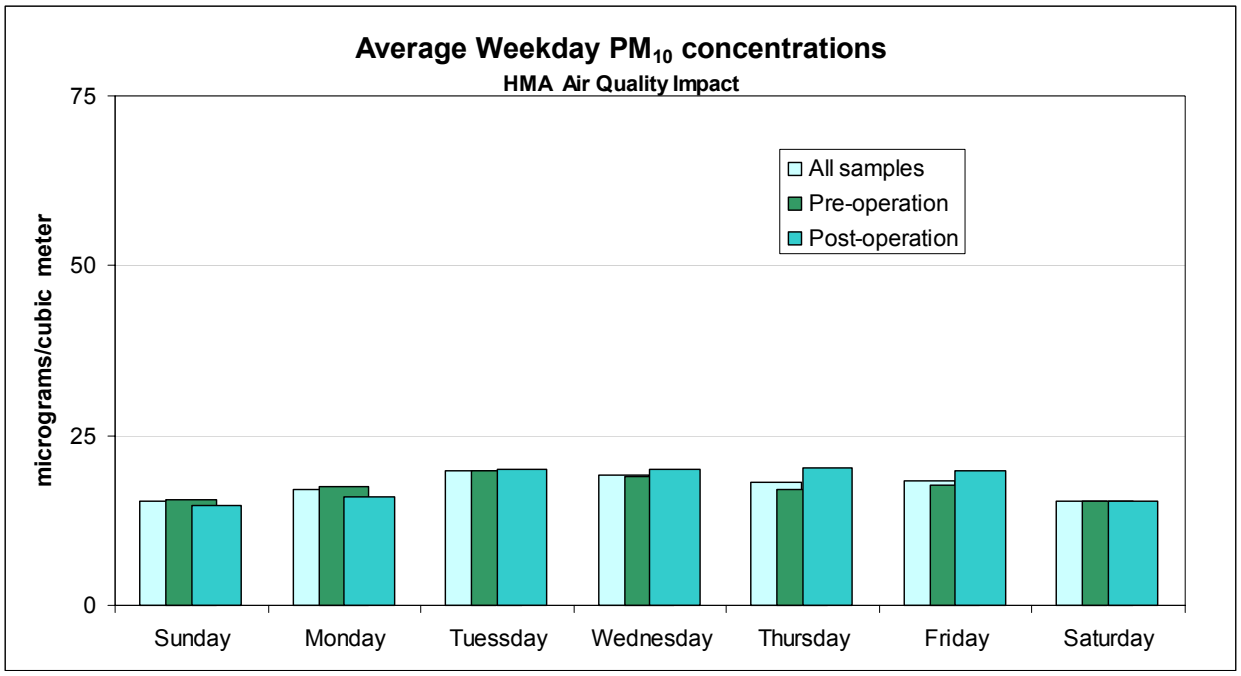




Particulate Matter (PM10):

- The daily National Ambient Air Quality Standard for PM_{10} is 150 $\mu g/M^3$ (24-hour average concentration). The South Carolina annual PM_{10} standard is 50 $\mu g/M^3$.
- During the study period, average PM_{10} concentrations did not exceed either standard.
- The average PM_{10} concentration for the study period was 18 $\mu g/M^3$.

- During the pre-operational sampling, the PM_{10} average was 17 $\mu g/M^3$, and during the post-operational period the average was 18 $\mu g/M^3$.
- The maximum concentration detected at the study site was 72 $\mu g/M^3$ on February 27, 2009, which was approximately one half of the level of the 24-hour standard of 150 $\mu g/M^3$.
- The distribution of daily concentrations was consistent with that of other typical PM_{10} sites in the SC Monitoring network and was not similar to that of known source impacted sites in the network.
- Average particulate concentrations detected at the study site were slightly higher than concentrations detected at the Chesterfield rural background site during the project period (15 $\mu g/M^3$). Chesterfield pre- and post-operational period averages were 15 $\mu g/M^3$ and 16 $\mu g/M^3$, respectively.
- Average PM_{10} concentrations throughout the day were consistent with other sites in South Carolina with slightly higher concentrations reflecting morning (7-8 AM) and afternoon and evening (5-8 PM) traffic impacts and the effects of typical daily atmospheric conditions and showing relatively lower concentrations throughout the day on weekends.



Conclusions

Operation of the hot mix asphalt plant did not appear to have a significant impact on typical daily and average ambient concentrations of particulate matter small enough to be inhaled, volatile organic compounds and carbonyl compounds at the monitoring location. There were increases in ambient concentrations of some the C_9-C_{14} alkanes, and the PAH, Naphthalene, in the samples taken following the start of hot mix asphalt operations but the maximum concentrations detected were below 0.5 micrograms per cubic meter and comparable to that reported in other areas of the southeast. The relatively increased concentrations of the lighter alkanes may be related to the use of diesel fuel. The majority of the compounds that make up diesel fuel are in the same range (C_{10}- C_{15}) as that detected in the fall sampling period.

Although the Naphthalene concentrations were elevated in the fall sampling period relative to that seen prior to operation of the asphalt plant, the maximum concentration detected (331 ng/M^3 on October 28, 2009) is less than 0.001% of the occupational exposure limit set by American Conference of Industrial Hygienists (ACGIH Threshold Limit Value -50 mg/M^3).

The monitoring project was disrupted by delays in the start of operations at the Hot Mix Asphalt plant, interrupted by air toxics monitoring projects elsewhere and had greater than expected data loss due to failures of particulate monitoring equipment. The monitoring site, chosen to provide representative measurements of ambient concentrations of emissions from the plant activity, was in place for seventeen months. Despite the problems, more than double the planned number of samples were collected for the pollutants of interest during three sampling episodes, providing an adequate representation of impacts prior to and after the start of hot mix asphalt operations.

The monitoring results did not indicate any significant change in the ambient air concentrations of the pollutants most likely associated with the operation of a hot mix asphalt plant. The relative increases in concentrations of Naphthalene and the C_9-C_{14} alkanes detected after the start of operations did not approach the level of the standards that have been set to be protective of health.

Air Quality Impact of a Hot Mix Asphalt Plant
Data Tables

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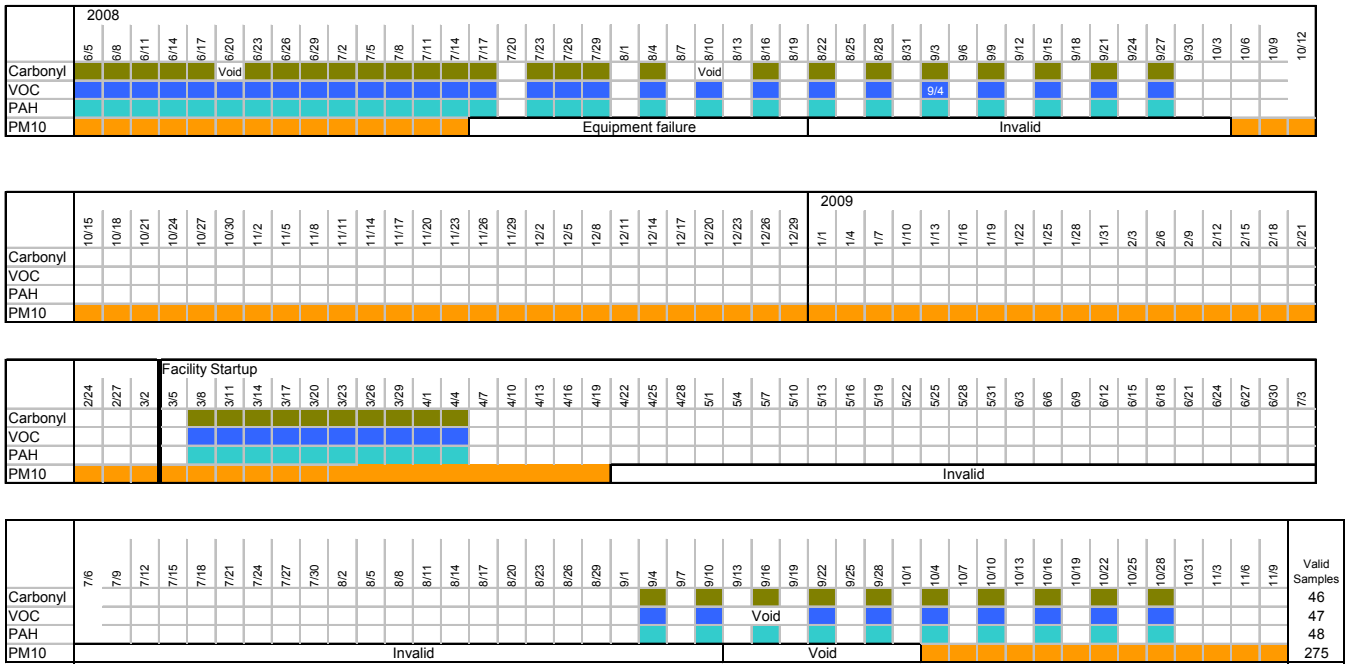
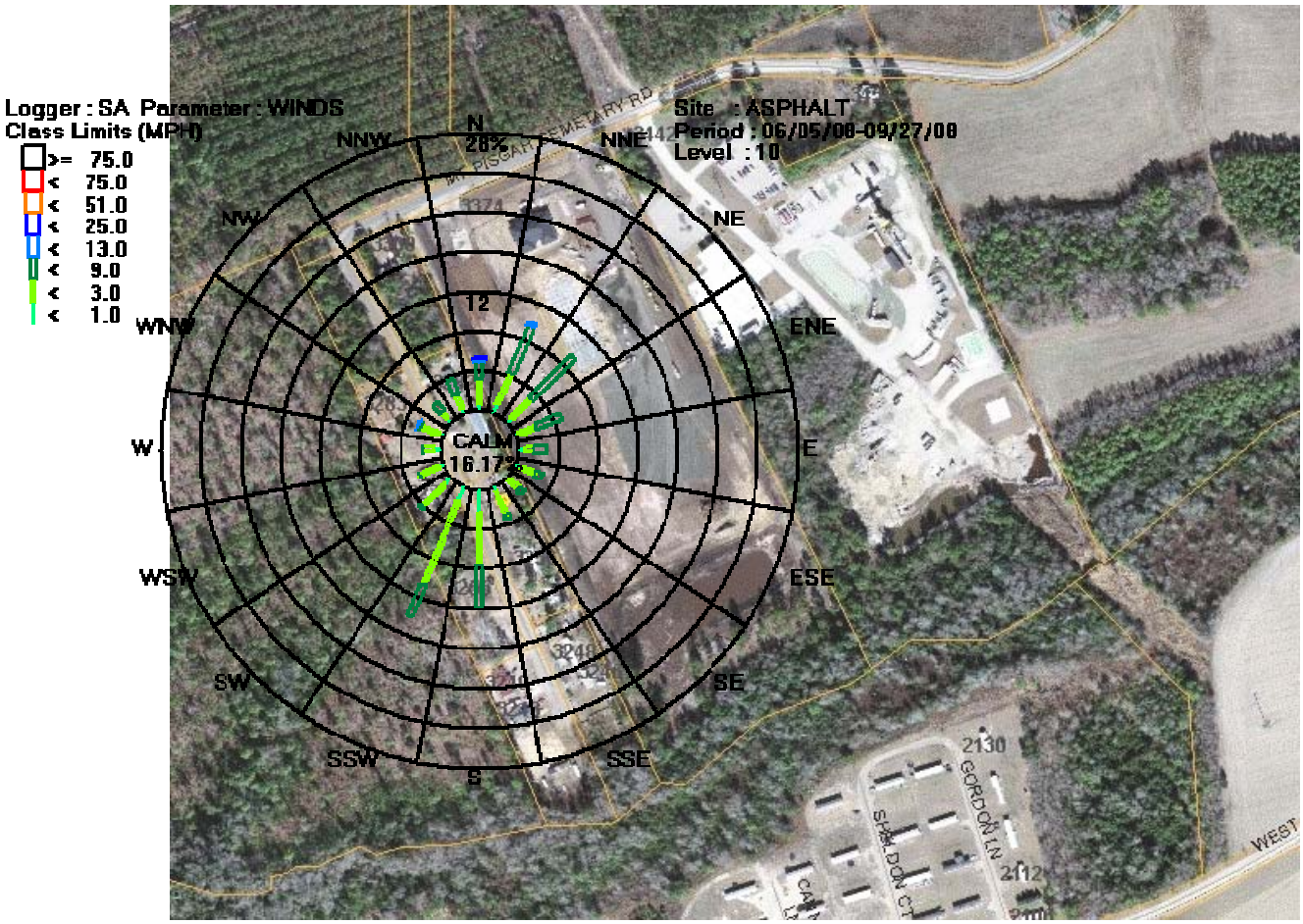
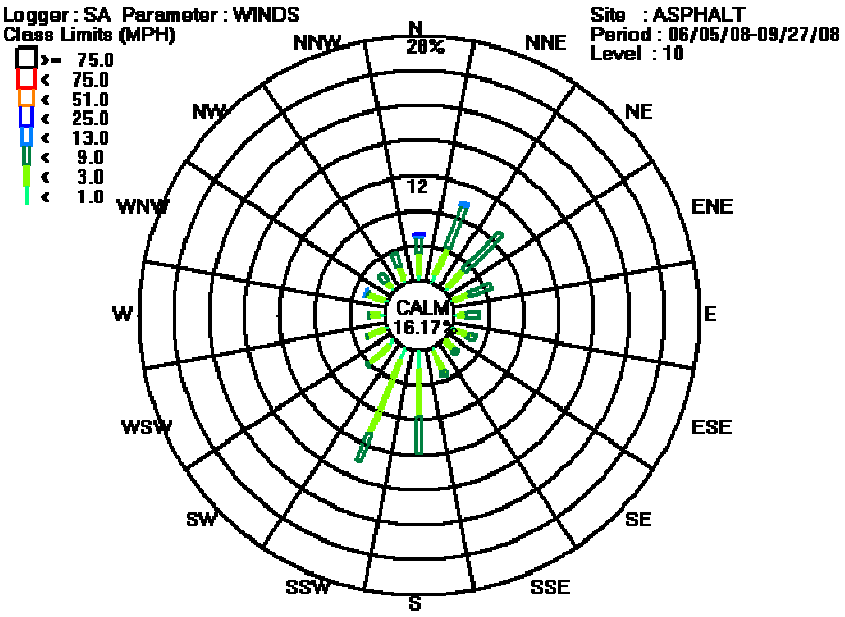
Project timeline and sample days

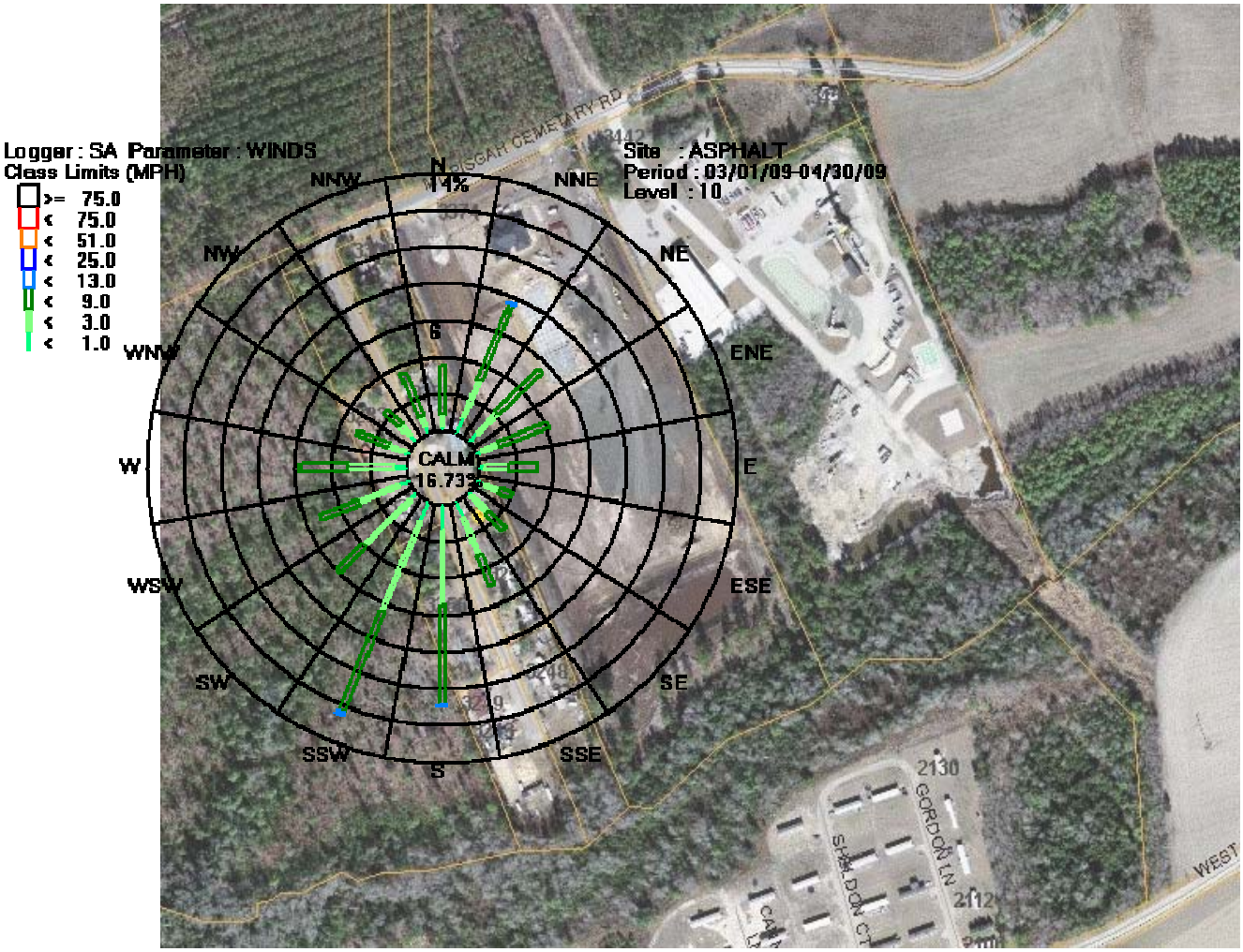


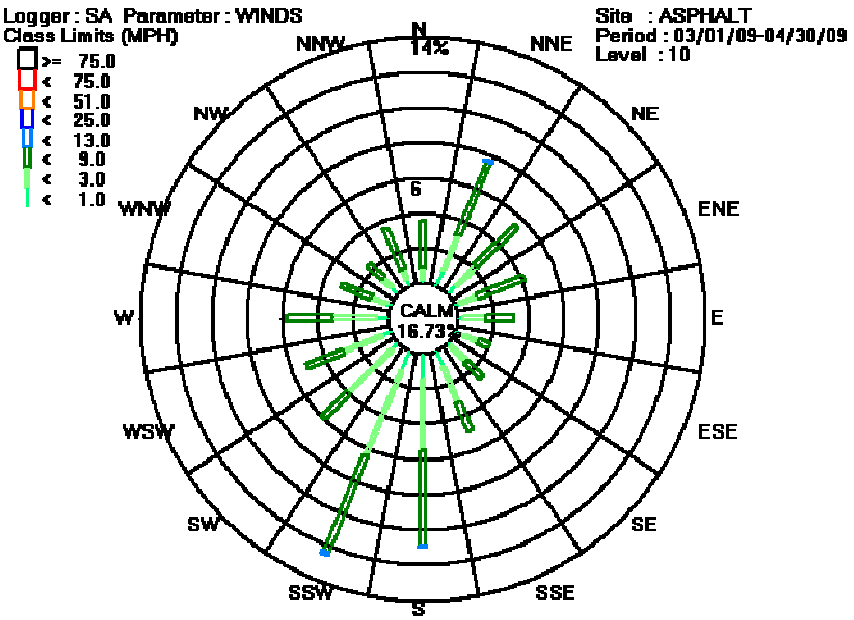
Wind Speed and Direction Distribution: 6/5 – 9/27/2008 Pre-operational Sampling



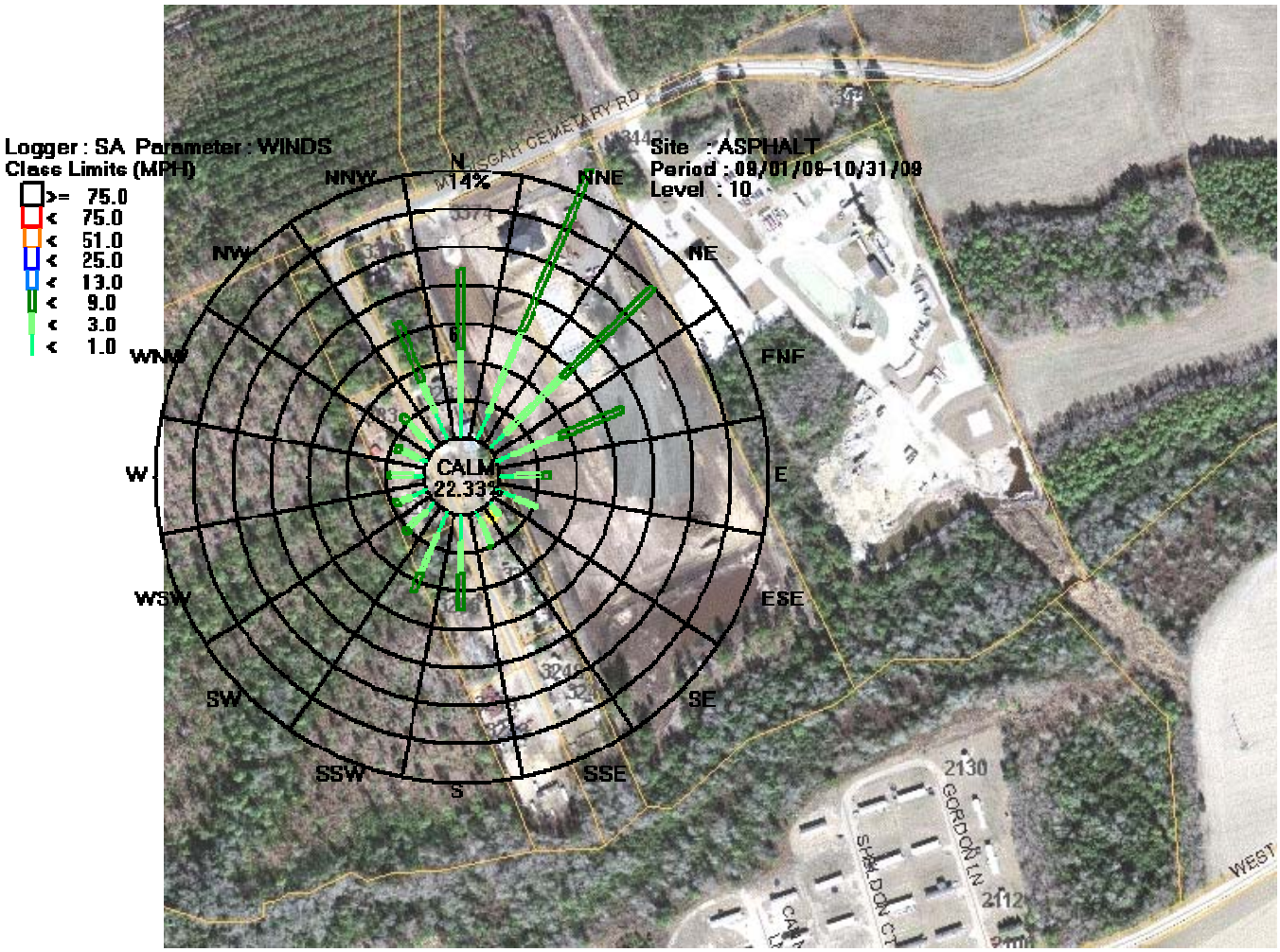


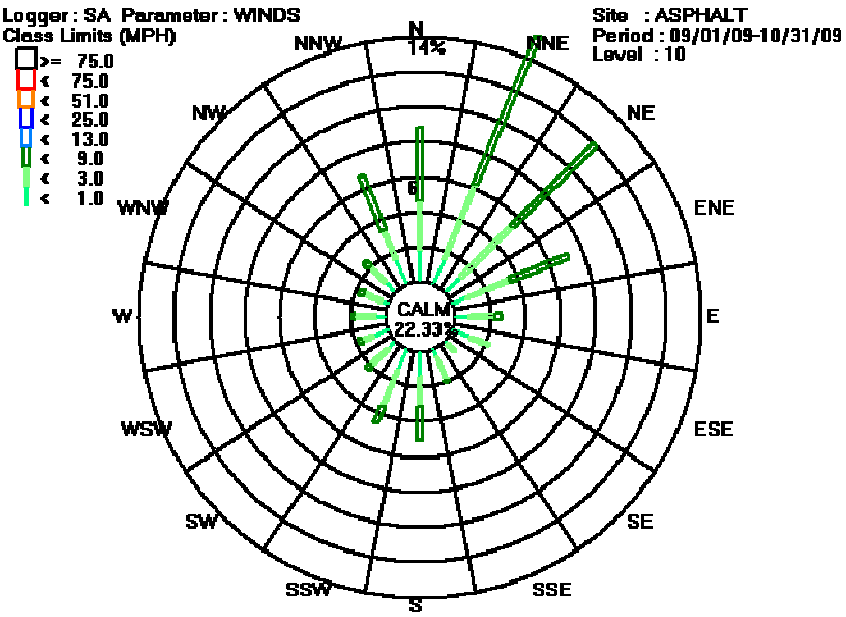
Wind Speed and Direction Distribution: 3/1 – 4/30/2009 Intermediate Sampling Period





Wind Speed and Direction Distribution: 9/1 – 10/31/2009 Post-operational Sampling Period





Volatile Organic Compound Data:

Pre-operational Study:

SAMPLE DATE	1,1,1-Trichloroethane, *Methyl Chloroform*	Benzene	Toluene	m,p-Xylene	o-Xylene
6/5/2008	0.00	0.43	5.86	0.89	1.30
6/8/2008	0.00	0.48	2.63	0.83	1.12
6/11/2008	0.00	0.39	1.46	0.35	0.45
6/14/2008	0.00	0.69	1.88	0.45	0.50
6/17/2008	0.00	0.50	2.09	0.57	0.91
6/20/2008	0.00	0.69	1.65	0.45	0.64
6/23/2008	0.00	0.15	0.88	0.35	0.45
6/26/2008	0.00	0.24	0.88	0.42	0.53
6/29/2008	0.00	0.24	0.95	0.45	0.53
7/2/2008	0.00	0.41	0.99	0.40	0.42
7/5/2008	0.00	0.08	0.36	0.10	0.08
7/8/2008	0.00	0.00	0.28	0.10	0.12
7/11/2008	0.00	0.10	0.50	0.16	0.19
7/14/2008	0.00	0.10	0.46	0.15	0.16
7/17/2008	0.00	0.46	1.15	0.40	0.46
7/23/2008	0.00	0.21	0.88	0.33	0.25
7/26/2008	0.00	0.75	1.95	0.65	0.64
7/29/2008	0.00	0.30	1.00	0.38	0.45
8/4/2008	0.00	0.06	0.17	0.16	0.15
8/10/2008	0.00	0.41	1.19	0.37	0.41
8/16/2008	0.00	0.33	1.10	0.14	0.12
8/22/2008	0.00	0.00	1.15	0.50	0.29
8/28/2008	0.00	0.00	0.00	0.00	0.00
9/4/2008	0.00	0.00	1.30	0.37	0.43
9/9/2008	0.00	0.00	0.86	0.28	0.24
9/15/2008	0.00	0.00	0.00	0.00	0.00
9/21/2008	0.00	0.00	0.00	0.00	0.00
9/27/2008	0.00	0.15	0.78	0.34	0.43
Pre-op Average:	0.00	0.26	1.16	0.34	0.40
Pre-op Minimum:	0.00	0.00	0.00	0.00	0.00
Pre-op Maximum:	0.00	0.75	5.86	0.89	1.30

Volatile Organic Compound Data:(continued)

Post-operational Study:

SAMPLE DATE	1,1,1-Trichloroethane, *Methyl Chloroform*	Benzene	Toluene	m,p-Xylene	o-Xylene
03/08/09	0.00	0.00	0.20	0.00	0.00
03/11/09	0.00	0.00	0.00	0.00	0.00
03/14/09	0.00	0.00	0.00	0.00	0.00
03/17/09	0.00	0.00	0.00	0.00	0.00
03/20/09	0.00	0.00	0.00	0.00	0.00
03/23/09	0.00	0.00	0.00	0.00	0.00
03/26/09	0.00	0.00	0.00	0.00	0.00
03/29/09	0.00	0.00	0.00	0.00	0.00
04/01/09	0.00	0.00	0.00	0.00	0.00
04/04/09	0.00	0.00	0.00	0.00	0.00
Spring Average:	0.00	0.00	0.02	0.00	0.00
Spring Minimum:	0.00	0.00	0.00	0.00	0.00
Spring Maximum:	0.00	0.00	0.20	0.00	0.00

09/04/09	0.00	0.00	0.00	0.00	0.00
09/10/09	0.00	0.00	0.00	0.00	0.00
09/16/09	VOID				
09/22/09	0.00	0.00	0.00	0.00	0.00
09/28/09	0.00	0.14	0.46	0.75	0.45
10/04/09	0.00	0.16	0.45	0.73	0.46
10/10/09	0.00	0.18	0.65	0.78	0.43
10/16/09	0.00	0.10	0.63	0.61	0.39
10/22/09	0.00	0.13	0.68	0.58	0.33
10/28/09	0.00	0.09	0.31	0.42	0.27
Fall Average:	0.00	0.09	0.35	0.43	0.26
Fall Minimum:	0.00	0.00	0.00	0.00	0.00
Fall Maximum:	0.00	0.18	0.68	0.78	0.46

Post-op Average:	0.00	0.04	0.18	0.20	0.12
Post-op Minimum:	0.00	0.00	0.00	0.00	0.00
Post-op Maximum:	0.00	0.18	0.68	0.78	0.46

Carbonyl Data:

Pre-operational Study:

Sample Date	Volume	Void Code	Formaldehyde Conc.(µg/m3)	Acetaldehyde Conc.(µg/m3)	Acetone Conc.(µg/m3)
06/05/08	0.178		6.62	1.40	3.65
06/08/08	0.174		8.95	2.07	5.28
06/11/08	0.174		6.54	1.38	3.90
06/14/08	0.173		4.15	0.98	3.52
06/17/08	0.169		7.38	1.59	4.67
06/20/08	0.070	VOID			
06/23/08	0.164		4.95	1.04	6.06
06/26/08	0.172		6.26	1.45	1.33
06/29/08	0.168		4.51	1.13	0.83
07/02/08	0.164		5.32	1.59	10.09
07/05/08	0.164		4.34	1.41	2.26
07/08/08	0.189		2.33	0.58	0.00
07/11/08	0.189		3.08	0.90	0.00
07/14/08	0.189		3.02	0.85	0.42
07/17/08	0.189		3.49	0.90	1.32
07/23/08	0.188		4.19	0.85	0.00
07/26/08	0.189		2.97	0.85	0.11
07/29/08	0.188		2.92	0.21	0.00
08/04/08	0.189		3.93	0.00	0.00
08/10/08	0.189	VOID			
08/16/08	0.189		2.97	0.58	2.02
08/22/08	0.189		2.01	0.32	1.01
08/28/08	0.189		2.65	0.64	0.53
09/03/08	0.189		3.77	0.85	2.76
09/09/08	0.189		1.75	0.21	0.05
09/15/08	0.188		3.18	0.64	0.69
09/21/08	0.189		2.23	0.53	1.54
09/27/08	0.188		2.98	0.74	2.02
	Pre-op Average:		**4.10**	**0.91**	**2.08**
	Pre-op Maximum:		**8.95**	**2.07**	**10.09**
	Pre-op Minimum:		**1.75**	**0.00**	**0.00**

Carbonyl Data: (continued)

Post-operational Study:

Sample Date	Volume	Void Code	Formaldehyde Conc.(µg/m3)	Acetaldehyde Conc.(µg/m3)	Acetone Conc.(µg/m3)
03/08/09	0.187		3.74	1.50	3.79
03/11/09	0.187		4.11	1.55	3.74
03/14/09	0.187		2.03	0.96	1.87
03/17/09	0.187		1.98	0.75	1.92
03/20/09	0.187		2.56	1.18	2.72
03/23/09	0.187		2.99	1.44	4.38
03/26/09	0.187		2.78	1.01	2.56
03/29/09	0.187		2.24	0.96	3.26
04/01/09	0.187		4.22	1.28	3.42
04/04/09	0.187		2.40	1.18	3.63
		Spring Average:	***2.91***	***1.18***	***3.13***
		Spring Maximum:	***4.22***	***1.55***	***4.38***
		Spring Minimum:	***1.98***	***0.75***	***1.87***
09/04/09	0.189		2.76	1.27	3.82
09/10/09	0.189		2.07	0.95	2.81
09/16/09	0.189		2.86	1.27	3.71
09/22/09	0.188		1.80	0.85	0.85
09/28/09	0.189		3.39	1.33	3.50
10/04/09	0.189		2.28	1.17	3.08
10/10/09	0.189		1.70	0.74	0.69
10/16/09	0.189		3.34	1.11	3.23
10/22/09	0.189		1.91	0.74	1.06
10/28/09	0.189		1.43	0.74	0.74
		Fall Average:	***2.35***	***1.02***	***2.35***
		Fall Maximum:	***3.39***	***1.33***	***3.82***
		Fall Minimum:	***1.43***	***0.74***	***0.69***
		Post-op Average:	**2.63**	**1.10**	**2.74**
		Post-op Maximum:	**4.22**	**1.55**	**4.38**
		Post-op Minimum:	**1.43**	**0.74**	**0.69**

Polycyclic Aromatic Hydrocarbon Data:

Pre-operational Study:

Sample Date	Volume	Compound:	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene
		Detection Limit:	0.17	0.37	0.37	0.17	0.37	0.37	0.37	0.37	3.57	3.57
06/05/08	351		18.00	0.00	3.00	3.00	9.00	0.00	2.00	1.00	0.00	0.00
06/08/08	341		51.00	0.00	4.00	3.00	10.00	0.00	2.00	2.00	0.00	0.00
06/11/08	357		52.00	0.00	4.00	4.00	10.00	0.00	2.00	2.00	0.00	0.00
06/14/08	337		32.00	0.00	3.00	3.00	9.00	0.00	0.00	1.00	0.00	0.00
06/17/08	331		29.00	0.00	2.00	2.00	5.00	0.00	0.00	1.00	0.00	0.00
06/20/08	355		42.00	0.00	2.00	2.00	6.00	0.00	0.00	0.00	0.00	0.00
06/23/08	331		15.00	0.00	1.00	1.00	4.00	0.00	1.00	1.00	0.00	0.00
06/26/08	333		17.00	0.00	2.00	2.00	7.00	0.00	1.00	0.00	0.00	0.00
06/29/08	338		13.00	0.00	1.00	1.00	5.00	0.00	1.00	0.00	0.00	0.00
07/02/08	343		27.00	0.00	4.00	3.00	7.00	0.00	0.00	0.00	0.00	0.00
07/05/08	327		21.00	0.00	3.00	2.00	7.00	0.00	0.00	0.00	0.00	0.00
07/08/08	324		19.00	0.00	3.00	2.00	7.00	0.00	1.00	1.00	0.00	0.00
07/11/08	338		9.00	0.00	1.00	1.00	4.00	0.00	0.00	0.00	0.00	0.00
07/14/08	329		19.00	0.00	3.00	2.00	5.00	0.00	1.00	0.00	0.00	0.00
07/17/08	336		6.00	0.00	1.00	1.00	5.00	0.00	1.00	1.00	0.00	0.00
07/20/08												
07/23/08	332		15.00	0.00	3.00	3.00	7.00	0.00	1.00	1.00	0.00	0.00
07/26/08	352		24.00	0.00	4.00	3.00	8.00	0.00	1.00	0.00	0.00	0.00
07/29/08	333		13.00	0.00	3.00	2.00	7.00	0.00	1.00	1.00	0.00	0.00
08/04/08	326		10.00	0.00	3.00	2.00	7.00	0.00	1.00	1.00	0.00	0.00
08/10/08	340		24.00	0.00	4.00	3.00	9.00	0.00	2.00	1.00	0.00	0.00
08/16/08	339		6.00	0.00	0.00	2.00	4.00	0.00	0.00	0.00	0.00	0.00
08/22/08	346		5.00	0.00	0.00	1.00	3.00	0.00	0.00	0.00	0.00	0.00
08/28/08	330		92.00	0.00	3.00	2.00	6.00	0.00	0.00	1.00	0.00	0.00
09/03/08	335		91.00	0.00	3.00	2.00	6.00	0.00	1.00	1.00	0.00	0.00
09/09/08	345		76.00	0.00	4.00	3.00	7.00	0.00	0.00	1.00	0.00	0.00
09/15/08	333		22.00	0.00	0.00	1.00	4.00	0.00	0.00	1.00	0.00	0.00
09/21/08	345		7.00	0.00	0.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00
09/27/08	339		53.00	0.00	2.00	2.00	4.00	0.00	0.00	0.00	0.00	0.00
		Pre-op Average:	28.86	0.00	2.36	2.11	6.21	0.00	0.68	0.64	0.00	0.00
		Pre-op Minimum:	5.00	0.00	0.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00
		Pre-op Maximum:	92.00	0.00	4.00	4.00	10.00	0.00	2.00	2.00	0.00	0.00

Polyaromatic hydrocarbon Compound Data:(continued)

Post-operational Study:

Sample Date	Volume	Compound:	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene
		Detection Limit:	0.17	0.37	0.37	0.17	0.37	0.37	0.37	0.37	3.57	3.57
03/08/09	320		57.00	0.00	0.00	2.00	5.00	0.00	0.00	0.00	0.00	0.00
03/11/09	341		7.00	0.00	0.00	1.00	4.00	0.00	0.00	0.00	0.00	0.00
03/14/09	323		18.00	0.00	0.00	1.00	3.00	0.00	0.00	1.00	0.00	0.00
03/17/09	349		9.00	0.00	0.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00
03/20/09	325		9.00	0.00	0.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00
03/23/09	324		17.00	0.00	0.00	1.00	3.00	0.00	0.00	1.00	0.00	0.00
03/26/09	323		1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
03/29/09	326		4.00	0.00	1.00	1.00	3.00	0.00	0.00	0.00	0.00	0.00
04/01/09	336		4.00	0.00	0.00	1.00	3.00	0.00	0.00	0.00	0.00	0.00
04/04/09	308		36.00	0.00	2.00	2.00	6.00	0.00	1.00	0.00	0.00	0.00
		Spring Average:	16.20	0.00	0.30	1.10	3.20	0.00	0.10	0.20	0.00	0.00
		Spring Minimum:	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
		Spring Maximum:	57.00	0.00	2.00	2.00	6.00	0.00	1.00	1.00	0.00	0.00

Sample Date	Volume	Compound:	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene
		Detection Limit:	0.17	0.37	0.37	0.17	0.37	0.37	0.37	0.37	3.57	3.57
09/04/09	342		244.00	0.00	0.00	2.00	3.00	0.00	0.00	0.00	0.00	0.00
09/10/09	336		152.00	0.00	0.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00
09/16/09	333		119.00	0.00	3.00	3.00	5.00	0.00	0.00	0.00	0.00	0.00
09/22/09	328		50.00	0.00	0.00	2.00	3.00	0.00	0.00	0.00	0.00	0.00
09/28/09	345		67.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
10/04/09	352		222.00	0.00	4.00	2.00	3.00	3.00	0.00	0.00	0.00	0.00
10/10/09	339		99.00	0.00	2.00	2.00	5.00	0.00	1.00	0.00	0.00	0.00
10/16/09	344		36.00	0.00	0.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00
10/22/09	331		313.00	0.00	3.00	2.00	4.00	0.00	0.00	0.00	0.00	0.00
10/28/09	339		331.00	0.00	1.00	1.00	3.00	0.00	0.00	0.00	0.00	0.00
		Fall Average:	163.30	0.00	1.30	1.70	3.10	0.30	0.10	0.00	0.00	0.00
		Fall Minimum:	36.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
		Fall Maximum:	331.00	0.00	4.00	3.00	5.00	3.00	1.00	0.00	0.00	0.00

Post-op Average:	89.75	0.00	0.80	1.40	3.15	0.15	0.10	0.10	0.00	0.00
Post-op Minimum:	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Post-op Maximum:	331.00	0.00	4.00	3.00	6.00	3.00	1.00	1.00	0.00	0.00

Alkane Data:

Pre-operational Study :

Sample Date	Volume	Compound:	Nonane	Decane	Undecane	Dodecane	Tetradecane	Hexadecane	Octadecane	Eicosane	Docosane	Tetracosane	Hexacosane
		Detection Limit:	*0.29*	*0.29*	*0.29*	*0.29*	*0.29*	*0.86*	*0.86*	*0.86*	*0.86*	*1.43*	*1.43*
06/05/08	351		0.00	3.00	10.00	7.00	13.00	9.00	8.00	10.00	13.00	11.00	0.00
06/08/08	341		0.00	4.00	19.00	11.00	13.00	9.00	8.00	10.00	12.00	13.00	4.00
06/11/08	357		0.00	7.00	23.00	13.00	16.00	9.00	8.00	9.00	10.00	11.00	4.00
06/14/08	337		0.00	5.00	17.00	10.00	11.00	8.00	7.00	8.00	10.00	13.00	7.00
06/17/08	331		0.00	6.00	19.00	10.00	12.00	6.00	5.00	5.00	7.00	8.00	2.00
06/20/08	355		0.00	8.00	27.00	16.00	22.00	9.00	6.00	6.00	7.00	11.00	6.00
06/23/08	331		0.00	4.00	12.00	6.00	7.00	4.00	4.00	5.00	6.00	6.00	2.00
06/26/08	333		29.00	7.00	21.00	10.00	11.00	6.00	7.00	7.00	9.00	10.00	5.00
06/29/08	338		28.00	6.00	14.00	8.00	8.00	3.00	3.00	4.00	5.00	6.00	0.00
07/02/08	343		0.00	5.00	22.00	10.00	13.00	7.00	7.00	6.00	8.00	9.00	4.00
07/05/08	327		0.00	4.00	15.00	10.00	12.00	7.00	6.00	7.00	10.00	11.00	4.00
07/08/08	324		0.00	4.00	15.00	10.00	14.00	7.00	6.00	7.00	10.00	12.00	4.00
07/11/08	338		0.00	3.00	13.00	8.00	11.00	5.00	4.00	5.00	8.00	10.00	3.00
07/14/08	329		0.00	8.00	25.00	16.00	14.00	9.00	6.00	6.00	9.00	11.00	3.00
07/17/08	336		0.00	24.00	85.00	30.00	25.00	22.00	14.00	9.00	8.00	9.00	2.00
07/20/08													
07/23/08	332		18.00	6.00	20.00	11.00	11.00	7.00	5.00	5.00	7.00	8.00	2.00
07/26/08	352		0.00	6.00	24.00	12.00	11.00	8.00	6.00	7.00	11.00	14.00	5.00
07/29/08	333		0.00	4.00	15.00	8.00	10.00	7.00	4.00	6.00	8.00	10.00	3.00
08/04/08	326		0.00	5.00	14.00	10.00	9.00	8.00	7.00	7.00	11.00	14.00	8.00
08/10/08	340		0.00	6.00	18.00	12.00	11.00	6.00	4.00	4.00	7.00	7.00	0.00
08/16/08	339		0.00	4.00	14.00	13.00	15.00	13.00	7.00	4.00	6.00	6.00	0.00
08/22/08	346		0.00	5.00	19.00	19.00	23.00	20.00	11.00	5.00	4.00	4.00	0.00
08/28/08	330		0.00	3.00	12.00	5.00	6.00	6.00	4.00	5.00	9.00	10.00	4.00
09/03/08	335		0.00	6.00	19.00	13.00	13.00	8.00	7.00	5.00	6.00	8.00	0.00
09/09/08	345		0.00	7.00	22.00	14.00	12.00	8.00	5.00	6.00	8.00	10.00	3.00
09/15/08	333		0.00	4.00	13.00	3.00	10.00	8.00	5.00	5.00	6.00	9.00	4.00
09/21/08	345		0.00	6.00	21.00	13.00	10.00	9.00	5.00	2.00	3.00	3.00	0.00
09/27/08	339		0.00	8.00	26.00	33.00	14.00	5.00	3.00	3.00	5.00	7.00	3.00
		Pre-op Average:	2.68	6.00	20.50	12.18	12.75	8.32	6.14	6.00	7.96	9.32	2.93
		Pre-op Minimum:	0.00	3.00	10.00	3.00	6.00	3.00	3.00	2.00	3.00	3.00	0.00
		Pre-op Maximum:	29.00	24.00	85.00	33.00	25.00	22.00	14.00	10.00	13.00	14.00	8.00

Alkane Data:(continued)

Post-operational Study

Sample Date	Volume	Compound:	Nonane	Decane	Undecane	Dodecane	Tetradecane	Hexadecane	Octadecane	Eicosane	Docosane	Tetracosane	Hexacosane
		Detection Limit:	***0.29***	***0.29***	***0.29***	***0.29***	***0.29***	***0.86***	***0.86***	***0.86***	***0.86***	***1.43***	***1.43***
03/08/09	320		50.00	25.00	50.00	30.00	22.00	23.00	28.00	24.00	15.00	10.00	0.00
03/11/09	341		48.00	69.00	144.00	40.00	15.00	14.00	18.00	20.00	14.00	9.00	0.00
03/14/09	323		23.00	15.00	30.00	16.00	9.00	8.00	14.00	8.00	5.00	3.00	0.00
03/17/09	349		17.00	15.00	35.00	6.00	11.00	6.00	6.00	5.00	3.00	0.00	0.00
03/20/09	325		35.00	39.00	76.00	48.00	22.00	13.00	8.00	5.00	4.00	2.00	0.00
03/23/09	324		20.00	21.00	48.00	31.00	16.00	10.00	12.00	10.00	8.00	6.00	2.00
03/26/09	323		0.00	0.00	2.00	0.00	2.00	1.00	0.00	3.00	2.00	0.00	0.00
03/29/09	326		7.00	3.00	6.00	4.00	5.00	4.00	6.00	7.00	5.00	3.00	0.00
04/01/09	336		4.00	4.00	16.00	16.00	11.00	10.00	12.00	15.00	14.00	9.00	3.00
04/04/09	308		17.00	16.00	31.00	33.00	25.00	9.00	7.00	6.00	7.00	4.00	0.00
		Spring Average:	19.00	20.22	43.11	21.56	12.89	8.33	9.22	8.78	6.89	4.00	0.56
		Spring Minimum:	0.00	0.00	2.00	0.00	2.00	1.00	0.00	3.00	2.00	0.00	0.00
		Spring Maximum:	48.00	69.00	144.00	48.00	25.00	14.00	18.00	20.00	14.00	9.00	3.00

Sample Date	Volume	Compound:	Nonane	Decane	Undecane	Dodecane	Tetradecane	Hexadecane	Octadecane	Eicosane	Docosane	Tetracosane	Hexacosane
		Detection Limit:	***0.29***	***0.29***	***0.29***	***0.29***	***0.29***	***0.86***	***0.86***	***0.86***	***0.86***	***1.43***	***1.43***
09/04/09	342		8.00	10.00	34.00	26.00	25.00	15.00	12.00	7.00	3.00	2.00	0.00
09/10/09	336		177.00	273.00	328.00	96.00	32.00	19.00	10.00	5.00	4.00	2.00	0.00
09/16/09	333		8.00	11.00	33.00	20.00	18.00	9.00	7.00	5.00	4.00	2.00	0.00
09/22/09	328		10.00	18.00	48.00	42.00	41.00	21.00	6.00	4.00	3.00	0.00	0.00
09/28/09	345		4.00	4.00	9.00	3.00	5.00	3.00	2.00	1.00	0.00	0.00	0.00
10/04/09	352		6.00	6.00	15.00	9.00	7.00	4.00	2.00	0.00	0.00	0.00	0.00
10/10/09	339		3.00	3.00	10.00	6.00	8.00	3.00	2.00	2.00	2.00	0.00	0.00
10/16/09	344		7.00	8.00	20.00	13.00	9.00	5.00	2.00	0.00	0.00	0.00	0.00
10/22/09	331		32.00	35.00	71.00	46.00	26.00	9.00	5.00	3.00	2.00	2.00	0.00
10/28/09	339		8.00	6.00	11.00	6.00	7.00	2.00	1.00	0.00	0.00	0.00	0.00
		Fall Average:	28.33	40.44	60.56	26.78	17.00	8.33	4.11	2.22	1.67	0.67	0.00
		Fall Minimum:	3.00	3.00	9.00	3.00	5.00	2.00	1.00	0.00	0.00	0.00	0.00
		Fall Maximum:	177.00	273.00	328.00	96.00	41.00	21.00	10.00	5.00	4.00	2.00	0.00

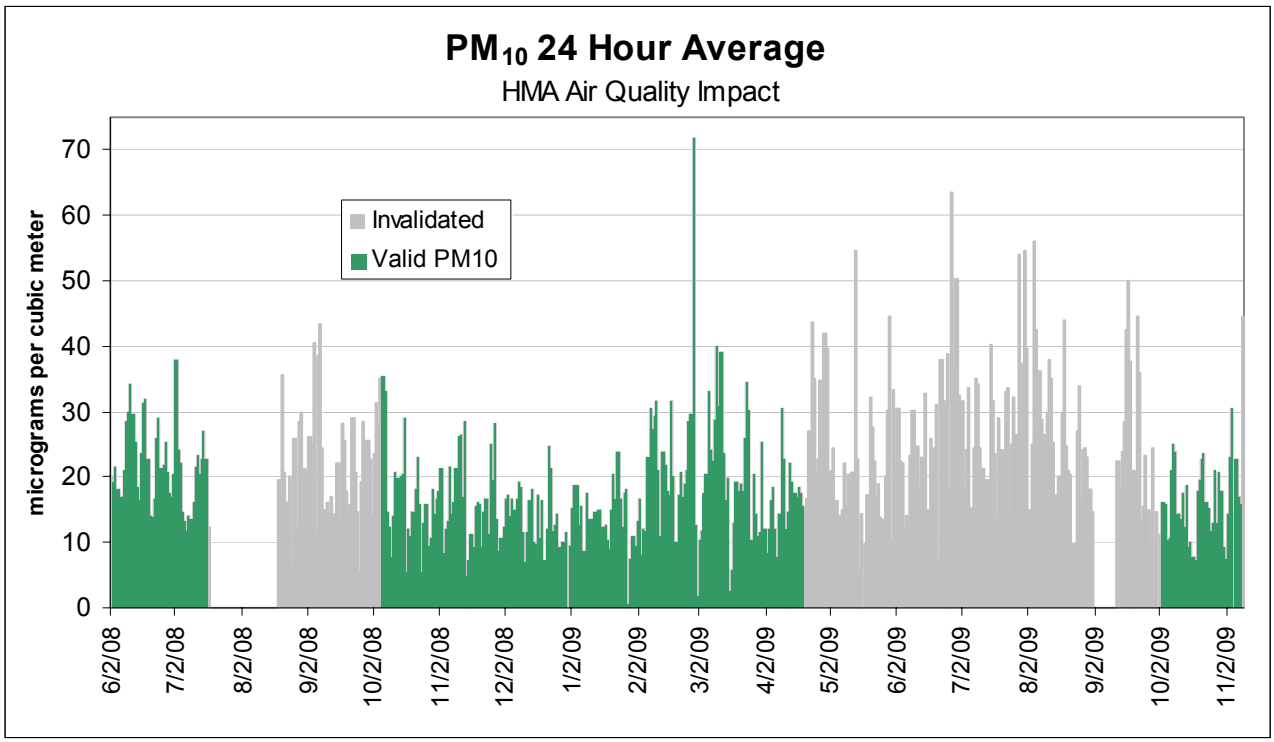
Post-op Average:	24.20	29.05	50.85	24.55	15.80	9.40	8.00	6.50	4.75	2.70	0.25
Post-op Minimum:	0.00	0.00	2.00	0.00	2.00	1.00	0.00	0.00	0.00	0.00	0.00
Post-op Maximum:	177.00	273.00	328.00	96.00	41.00	23.00	28.00	24.00	15.00	10.00	3.00

Particulate Data:

Sample Date	PM10 ug/M3	Sample Date	PM10 ug/M3	Sample Date	PM10 ug/M3	Sample Date	PM10 ug/M3	Sample Date	PM10 ug/M3	Sample Date	PM10 ug/M3
6/1/08	-	9/1/08	DA	12/1/08	10.8	3/1/09	1.7	6/1/09	DA	9/1/09	AN
6/2/08	-	9/2/08	DA	12/2/08	12.4	3/2/09	10.4	6/2/09	DA	9/2/09	AN
6/3/08	AI	9/3/08	DA	12/3/08	16.5	3/3/09	11.9	6/3/09	DA	9/3/09	AN
6/4/08	19.1	9/4/08	DA	12/4/08	17.4	3/4/09	17.6	6/4/09	DA	9/4/09	AN
6/5/08	21.6	9/5/08	DA	12/5/08	14.2	3/5/09	20.4	6/5/09	DA	9/5/09	AN
6/6/08	18.0	9/6/08	DA	12/6/08	16.8	3/6/09	33.0	6/6/09	DA	9/6/09	AN
6/7/08	17.0	9/7/08	DA	12/7/08	14.9	3/7/09	24.0	6/7/09	DA	9/7/09	AN
6/8/08	17.0	9/8/08	DA	12/8/08	16.6	3/8/09	22.4	6/8/09	DA	9/8/09	AN
6/9/08	20.9	9/9/08	DA	12/9/08	19.2	3/9/09	28.9	6/9/09	DA	9/9/09	AN
6/10/08	28.6	9/10/08	DA	12/10/08	18.5	3/10/09	39.8	6/10/09	DA	9/10/09	AN
6/11/08	29.9	9/11/08	DA	12/11/08	11.6	3/11/09	30.8	6/11/09	DA	9/11/09	AN
6/12/08	34.3	9/12/08	DA	12/12/08	6.9	3/12/09	39.1	6/12/09	DA	9/12/09	AN
6/13/08	29.5	9/13/08	DA	12/13/08	11.4	3/13/09	23.5	6/13/09	DA	9/13/09	DA
6/14/08	25.3	9/14/08	DA	12/14/08	16.3	3/14/09	16.4	6/14/09	DA	9/14/09	DA
6/15/08	18.4	9/15/08	DA	12/15/08	18.0	3/15/09	19.9	6/15/09	DA	9/15/09	DA
6/16/08	16.3	9/16/08	DA	12/16/08	10.2	3/16/09	2.5	6/16/09	DA	9/16/09	DA
6/17/08	23.5	9/17/08	DA	12/17/08	9.9	3/17/09	5.8	6/17/09	DA	9/17/09	DA
6/18/08	31.2	9/18/08	DA	12/18/08	17.2	3/18/09	12.9	6/18/09	DA	9/18/09	DA
6/19/08	32.0	9/19/08	DA	12/19/08	10.7	3/19/09	19.3	6/19/09	DA	9/19/09	DA
6/20/08	22.7	9/20/08	DA	12/20/08	16.5	3/20/09	17.8	6/20/09	DA	9/20/09	DA
6/21/08	14.0	9/21/08	DA	12/21/08	7.2	3/21/09	18.9	6/21/09	DA	9/21/09	DA
6/22/08	13.7	9/22/08	DA	12/22/08	12.0	3/22/09	17.7	6/22/09	DA	9/22/09	DA
6/23/08	16.8	9/23/08	DA	12/23/08	24.8	3/23/09	25.8	6/23/09	DA	9/23/09	DA
6/24/08	25.8	9/24/08	DA	12/24/08	21.2	3/24/09	34.6	6/24/09	DA	9/24/09	DA
6/25/08	29.0	9/25/08	DA	12/25/08	11.8	3/25/09	30.2	6/25/09	DA	9/25/09	DA
6/26/08	21.3	9/26/08	DA	12/26/08	12.7	3/26/09	10.3	6/26/09	DA	9/26/09	DA
6/27/08	21.8	9/27/08	DA	12/27/08	14.3	3/27/09	20.5	6/27/09	DA	9/27/09	DA
6/28/08	25.3	9/28/08	DA	12/28/08	9.3	3/28/09	14.4	6/28/09	DA	9/28/09	DA
6/29/08	20.8	9/29/08	DA	12/29/08	10.0	3/29/09	10.9	6/29/09	DA	9/29/09	DA
6/30/08	17.5	9/30/08	DA	12/30/08	10.0	3/30/09	11.4	6/30/09	DA	9/30/09	AS
7/1/08	17.0	10/1/08	DA	12/31/08	11.4	3/31/09	25.4	7/1/09	DA	10/1/09	AS
7/2/08	20.4	10/2/08	DA	1/1/09	9.4	4/1/09	12.0	7/2/09	DA	10/2/09	AI
7/3/08	37.9	10/3/08	DA	1/2/09	15.2	4/2/09	8.2	7/3/09	DA	10/3/09	16.0
7/4/08	24.1	10/4/08	DA	1/3/09	18.7	4/3/09	12.0	7/4/09	DA	10/4/09	15.8
7/5/08	22.2	10/5/08	DA	1/4/09	18.5	4/4/09	16.4	7/5/09	DA	10/5/09	10.3
7/6/08	14.6	10/6/08	DA	1/5/09	12.8	4/5/09	18.3	7/6/09	DA	10/6/09	10.7
7/7/08	13.3	10/7/08	35.4	1/6/09	15.6	4/6/09	12.0	7/7/09	DA	10/7/09	21.0
7/8/08	11.9	10/8/08	33.1	1/7/09	8.7	4/7/09	7.9	7/8/09	DA	10/8/09	24.9
7/9/08	14.2	10/9/08	14.6	1/8/09	8.8	4/8/09	14.4	7/9/09	DA	10/9/09	24.0
7/10/08	13.5	10/10/08	12.3	1/9/09	17.6	4/9/09	30.3	7/10/09	DA	10/10/09	14.5
7/11/08	16.1	10/11/08	7.6	1/10/09	13.5	4/10/09	22.8	7/11/09	DA	10/11/09	13.4
7/12/08	21.7	10/12/08	14.1	1/11/09	13.5	4/11/09	12.1	7/12/09	DA	10/12/09	17.5
7/13/08	23.2	10/13/08	20.6	1/12/09	14.5	4/12/09	14.6	7/13/09	DA	10/13/09	12.5
7/14/08	20.4	10/14/08	19.9	1/13/09	14.6	4/13/09	22.0	7/14/09	DA	10/14/09	18.8
7/15/08	22.6	10/15/08	20.3	1/14/09	14.9	4/14/09	19.2	7/15/09	DA	10/15/09	9.1
7/16/08	26.9	10/16/08	20.4	1/15/09	14.9	4/15/09	17.5	7/16/09	DA	10/16/09	10.1
7/17/08	22.7	10/17/08	29.0	1/16/09	12.4	4/16/09	17.1	7/17/09	DA	10/17/09	7.9
7/18/08	AI	10/18/08	5.3	1/17/09	12.6	4/17/09	18.5	7/18/09	DA	10/18/09	7.3
7/19/08	AS	10/19/08	12.2	1/18/09	10.4	4/18/09	17.4	7/19/09	DA	10/19/09	17.8
7/20/08	AS	10/20/08	11.0	1/19/09	9.0	4/19/09	15.5	7/20/09	DA	10/20/09	19.6
7/21/08	AS	10/21/08	14.8	1/20/09	15.0	4/20/09	DA	7/21/09	DA	10/21/09	22.8
7/22/08	AS	10/22/08	18.2	1/21/09	20.3	4/21/09	DA	7/22/09	DA	10/22/09	23.7
7/23/08	AS	10/23/08	23.0	1/22/09	16.7	4/22/09	DA	7/23/09	DA	10/23/09	16.0
7/24/08	AS	10/24/08	15.9	1/23/09	23.8	4/23/09	DA	7/24/09	DA	10/24/09	15.3
7/25/08	AS	10/25/08	5.4	1/24/09	16.8	4/24/09	DA	7/25/09	DA	10/25/09	11.8
7/26/08	AS	10/26/08	12.8	1/25/09	12.5	4/25/09	DA	7/26/09	DA	10/26/09	12.9
7/27/08	AS	10/27/08	15.8	1/26/09	17.6	4/26/09	DA	7/27/09	DA	10/27/09	21.0
7/28/08	AS	10/28/08	9.4	1/27/09	18.0	4/27/09	DA	7/28/09	DA	10/28/09	13.0
7/29/08	AS	10/29/08	10.6	1/28/09	0.6	4/28/09	DA	7/29/09	DA	10/29/09	20.6
7/30/08	AS	10/30/08	18.2	1/29/09	7.3	4/29/09	DA	7/30/09	DA	10/30/09	17.7
7/31/08	AS	10/31/08	14.5	1/30/09	11.0	4/30/09	DA	7/31/09	DA	10/31/09	9.1
8/1/08	AS	11/1/08	16.7	1/31/09	9.5	5/1/09	DA	8/1/09	DA	11/1/09	7.4
8/2/08	AS	11/2/08	17.9	2/1/09	13.2	5/2/09	DA	8/2/09	DA	11/2/09	14.4
8/3/08	AS	11/3/08	21.2	2/2/09	16.8	5/3/09	DA	8/3/09	DA	11/3/09	22.9
8/4/08	AS	11/4/08	8.2	2/3/09	8.1	5/4/09	DA	8/4/09	DA	11/4/09	30.5
8/5/08	AS	11/5/08	12.0	2/4/09	12.2	5/5/09	DA	8/5/09	DA	11/5/09	AI
8/6/08	AS	11/6/08	13.2	2/5/09	11.7	5/6/09	DA	8/6/09	DA	11/6/09	22.6
8/7/08	AS	11/7/08	21.5	2/6/09	23.1	5/7/09	DA	8/7/09	DA	11/7/09	17.0
8/8/08	AS	11/8/08	14.5	2/7/09	30.5	5/8/09	DA	8/8/09	DA	11/8/09	15.8
8/9/08	AF	11/9/08	16.2	2/8/09	27.2	5/9/09	DA	8/9/09	DA	11/9/09	AI
8/10/08	AF	11/10/08	21.3	2/9/09	29.3	5/10/09	DA	8/10/09	DA		
8/11/08	AF	11/11/08	26.1	2/10/09	31.5	5/11/09	DA	8/11/09	DA		
8/12/08	AF	11/12/08	26.5	2/11/09	20.9	5/12/09	DA	8/12/09	DA		
8/13/08	AF	11/13/08	17.1	2/12/09	10.8	5/13/09	DA	8/13/09	DA		
8/14/08	AF	11/14/08	28.6	2/13/09	23.8	5/14/09	DA	8/14/09	DA		
8/15/08	AF	11/15/08	5.0	2/14/09	21.7	5/15/09	DA	8/15/09	DA		
8/16/08	AF	11/16/08	7.0	2/15/09	17.9	5/16/09	DA	8/16/09	DA		
8/17/08	AF	11/17/08	11.2	2/16/09	17.3	5/17/09	DA	8/17/09	DA		
8/18/08	AF	11/18/08	9.2	2/17/09	31.5	5/18/09	DA	8/18/09	DA		
8/19/08	AF	11/19/08	15.5	2/18/09	20.1	5/19/09	DA	8/19/09	DA		
8/20/08	AF	11/20/08	16.1	2/19/09	10.1	5/20/09	DA	8/20/09	DA		
8/21/08	DA	11/21/08	15.7	2/20/09	17.3	5/21/09	DA	8/21/09	DA		
8/22/08	DA	11/22/08	9.2	2/21/09	20.8	5/22/09	DA	8/22/09	DA		
8/23/08	DA	11/23/08	14.7	2/22/09	17.0	5/23/09	DA	8/23/09	DA		
8/24/08	DA	11/24/08	16.5	2/23/09	18.8	5/24/09	DA	8/24/09	DA		
8/25/08	DA	11/25/08	11.3	2/24/09	21.1	5/25/09	DA	8/25/09	DA		
8/26/08	DA	11/26/08	25.1	2/25/09	28.5	5/26/09	DA	8/26/09	DA		
8/27/08	DA	11/27/08	19.5	2/26/09	29.5	5/27/09	DA	8/27/09	DA		
8/28/08	DA	11/28/08	28.1	2/27/09	71.9	5/28/09	DA	8/28/09	DA		
8/29/08	DA	11/29/08	13.5	2/28/09	12.5	5/29/09	DA	8/29/09	DA		
8/30/08	DA	11/30/08	8.6			5/30/09	DA	8/30/09	DA		
8/31/08	DA					5/31/09	DA	8/31/09	AN		

Total Samples	275
Mean	17.6
Max	71.9
Pre Samples	192
Pre Mean	17.4
Max	71.9
Post Samples	83
Post Mean	17.9
Max	39.8

AI- Insufficient data (less than 18 hours)
AF – No Instrument on site
AN - Instrument malfunction
AS – Poor QA results
DA - Invalid data


PM10 24 Hour Average
HMA Air Quality Impact
micrograms per cubic meter
Invalidated
Valid PM10
0
10
20
30
40
50
60
70
6/2/08
7/2/08
8/2/08
9/2/08
10/2/08
11/2/08
12/2/08
1/2/09
2/2/09
3/2/09
4/2/09
5/2/09
6/2/09
7/2/09
8/2/09
9/2/09
10/2/09
11/2/09